

1     What is claimed is:

2             1.     An apparatus for chromatographically analyzing each of a plurality of  
3     samples in detector, comprising:

4             (a)     an autosampler to contain a plurality of samples for chromatographic  
5             analysis;

6             (b)     a plurality of chromatographic systems, each system comprising one or  
7             more pumps and one or more chromatography columns;

8             (c)     a detector for detecting compounds in said samples from each of said  
9             chromatography systems;

10            (d)     a valve positioned between said detector and said chromatography  
11            systems, said valve permitting each sample to reach the detector in sequence; and

12            (f)     a computer control device which adjusts the introduction of samples from  
13            said autosampler into said chromatography systems as well as the position of said  
14            valve to sequentially deliver said compounds in said samples to said detector.

15            2.     The apparatus of claim 1 wherein each chromatography system includes 4  
16     pumps and 4 columns.

17            3.     The apparatus of claim 1 wherein each chromatography system includes 8  
18     pumps and 4 columns.

19            4.     The apparatus of claim 3, wherein each column contains one pump for  
20     loading sample and one pump for eluting.

21            5.     The apparatus of claim 1 wherein said chromatography columns include a  
22     substantially uniformly distributed multiplicity of rigid, solid, porous particles with  
23     chromatographically active surfaces, said particles having average diameters of greater

1 than about 30  $\mu\text{m}$ , the interstitial volume between said particles being not less than about  
2 45% of the total volume of said column; and means for loading said surfaces with at least  
3 one solute that is reactive with said surfaces, by flowing a liquid mixture containing said  
4 solute through said body at a velocity sufficient to induce flow of said mixture within at  
5 least a substantial portion of said interstitial volume at a reduced velocity greater than  
6 about 5,000.

7 6. The apparatus of claim 1 wherein said detector is a mass spectrometer.

8 7. The apparatus of claim 1, wherein said computer control device collects  
9 pressure readings from each of said pumps and compares such readings to stored pressure  
10 readings and elects to shutdown one or more of said pumps when said readings deviate  
11 from said stored pressure readings.

12 8. The apparatus of claim 7 wherein said pressure readings further comprise  
13 reading of pressure data points over a period of time for each of said pumps.

14 9. An apparatus for chromatographically analyzing each of a plurality of  
15 samples in a detector, comprising:

16 (a) an autosampler to contain a plurality of samples for chromatographic  
17 analysis;

18 (b) a plurality of chromatography columns;

19 (c) a plurality of pumps associated with said plurality of columns to establish  
20 a flow of eluant from each of said plurality of columns;

21 (d) a detector for detecting compounds in said eluant from each of said  
22 columns;

1 (e) a valve positioned between said detector and said flow of eluant from said  
2 columns, said valve permitting each flow of eluant to reach the detector in  
3 sequence; and  
4 (f) a computer control device which adjusts the introduction of samples from  
5 said autosampler into said plurality of columns as well as the position of said  
6 valve to sequentially deliver said eluant to said detector.

7 10. The apparatus of claim 9 wherein said detector is a mass spectrometer.

8 11. The apparatus of claim 9 wherein said plurality of columns comprises at  
9 least four columns.

10 12. The apparatus of claim 9 wherein said valve positioned between said  
11 detector and said flow of eluant from said columns either selectively flows eluant from  
12 one of said plurality of columns to said detector, while simultaneously flowing eluant  
13 from other of said plurality of columns to a collector.

14 13. The apparatus of claim 9 wherein said columns include a substantially  
15 uniformly distributed multiplicity of rigid, solid, porous particles with  
16 chromatographically active surfaces, said particles having average diameters of greater  
17 than about 30  $\mu\text{m}$ , the interstitial volume between said particles being not less than about  
18 45% of the total volume of said column; and means for loading said surfaces with at least  
19 one solute that is reactive with said surfaces, by flowing a liquid mixture containing said  
20 solute through said body at a velocity sufficient to induce flow of said mixture within at  
21 least a substantial portion of said interstitial volume at a reduced velocity greater than  
22 about 5,000.

1           14.    A method of chromatographically analyzing each of a plurality of samples  
2    in a detector, comprising

3           (a)    providing an autosampler to contain a plurality of samples for  
4    chromatographic analysis;

5           (b)    providing a plurality of chromatography columns;

6           (c)    providing a plurality of pumps associated with said columns to establish a  
7    flow of eluant from each of said plurality of columns into said detector;

8           (d)    a valve positioned between said detector and said flow of eluant from said  
9    columns, said valve permitting each flow of eluant to reach the detector in  
10   sequence; and

11          (e)    providing a computer control device which adjusts the introduction of  
12   samples from said autosampler into said plurality of columns as well as the  
13   position of said valve to sequentially deliver said eluant to said detector.

14          15.    The method of claim 14 wherein said computer control device selects that  
15   point in time for introduction of each of said plurality of samples into said columns based  
16   upon input information, said input information indicating that point in time wherein said  
17   samples eluting from said column will exit said columns for detection by said detector.

18          16.    The method of claim 14 wherein said column is packed with a  
19   substantially uniformly distributed multiplicity of rigid, solid, porous particles with  
20   chromatographically active surfaces, so as to form a chromatography column having an  
21   interstitial volume between said particles, said particles having average diameters of not  
22   less than about 30  $\mu\text{m}$ ; and loading said surfaces with at least one solute that is reactive  
23   with said surfaces, by flowing a liquid mixture containing said solute through said

1 column at a velocity sufficient to induce flow of said mixture within at least a substantial  
2 portion of said interstitial volume at a reduced velocity greater than about 5,000.

3 17. In a chromatographic system containing a column, including a pump for  
4 eluting a mobile phase, and a detector for detecting compounds flowing out of said  
5 column, the improvement which comprises a computer control device that: (i) collects  
6 pressure readings over time from said pump to provide a pressure v. time tracing, (ii)  
7 compares such tracing to a stored pressure v. time tracing for said pump; and (iii) elects to  
8 shutdown said pump when said tracing deviates from said stored tracing.

9 18. The chromatographic system of claim 17, wherein said tracing deviates  
10 from said stored tracing by the slope or shape of the tracing between at least two pressure  
11 readings.

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